SECTION 2.3 FUTURE IMPERVIOUS COVER

Future impervious cover estimates were projected based on developable land and current zoning. Impervious cover coefficients were developed for each major zoning category outlined in Harford County's Zoning Ordinance (Harford County, 2002). For the purposes of this analysis, full build-out of current zoning was assumed for future conditions. Consequently, the future impervious cover estimates represent the maximum level of development that can be expected in the subwatershed, since not all land that are zoned for a particular land use will ultimately be built (i.e., economic conditions, access, lack of infrastructure, etc.).

To project future impervious cover, undeveloped lands were identified within each subwatershed, based on the current land use. Next, unbuildable land was subtracted from the undeveloped land. Unbuildable lands include conservation easements, parks, DNR owned land, 100-year floodplain buffer (defined in County code as 75ft beyond 100-year delineation), stream buffers (depending on the stream, the County Zoning Ordinance may require either a 150ft or 75ft buffer on both sides of the stream), wetland buffers (County Zoning Ordinance requires that wetlands exceeding 40,000ft^2 have a 75 foot buffer), and slopes greater than 25%. The remaining area was then multiplied by an estimated impervious cover coefficient (See Table 5.)

Table 5. Harford County Zoning Categories and Assigned Impervious Cover %

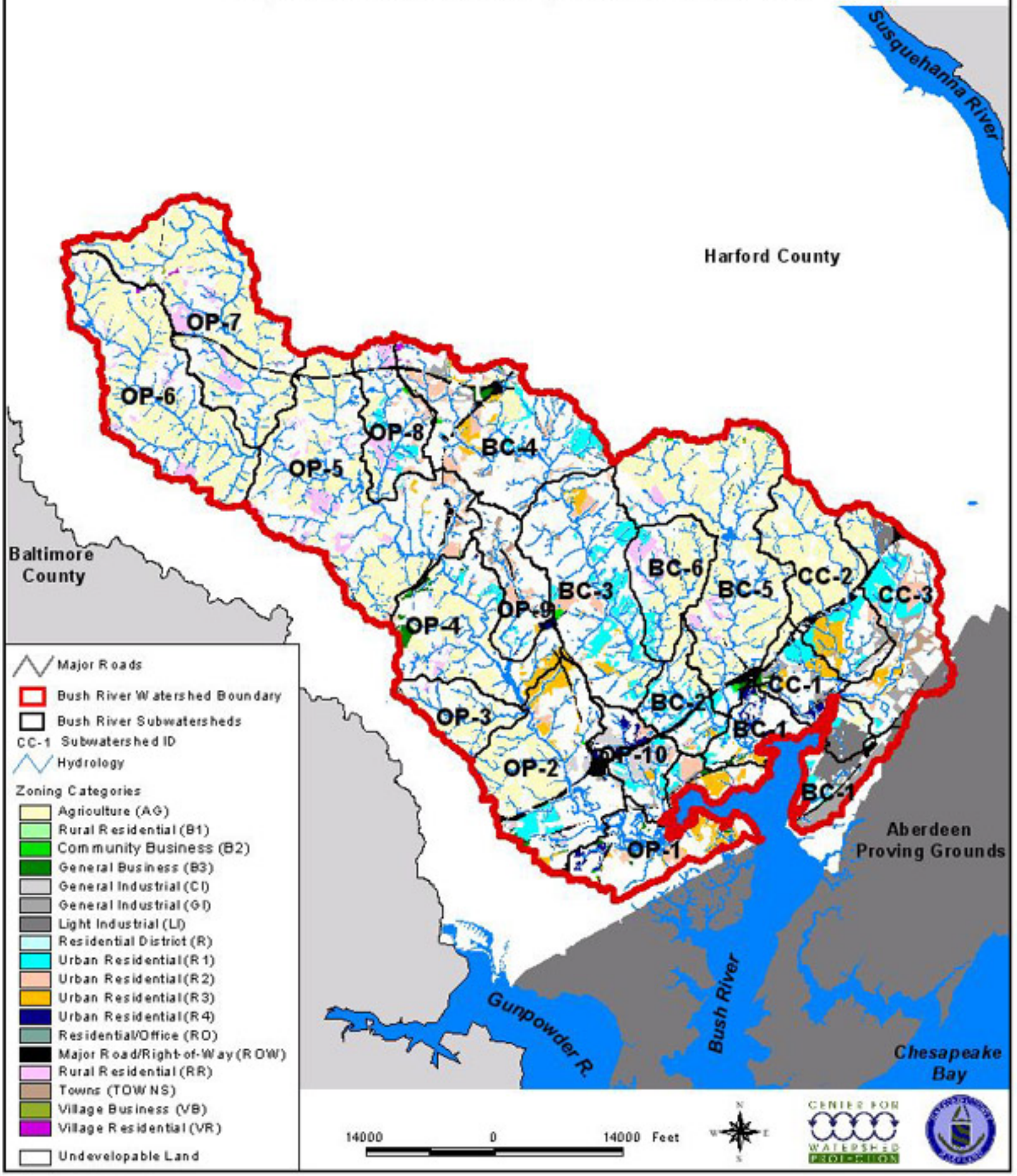
Zoning Category	Description	% Impervious
AG	Agriculture	1.9
RR	Rural Residential	10.6
R	Residential District	14.3
R1	Urban Residential	21.2
R2	Urban Residential	27.8
R3	Urban Residential	30.0
R4	Urban Residential	32.6
RO	Residential/Office	44.4
VR	Village Residential	40.9
VB	Village Business	65.6
B1	Neighborhood Business	72.2
B2	Community Business	72.2
B3	General Business	72.2
C1	General Industrial	53.4
L1	Light Industrial	53.4
G1	General Industrial	53.4
TOWNS	Towns	53.4
ROW	Major Highways and assoc. ROWs	70.0

A graphical presentation of future impervious cover for the Bush River watershed is provided in Map 6. There were seven subwatersheds which went from Impacted in the Current IC scenario to Non-Supporting. All of these subwatershed fall within the development envelope. The results of the calculations are presented in Table 6 and Map 7.

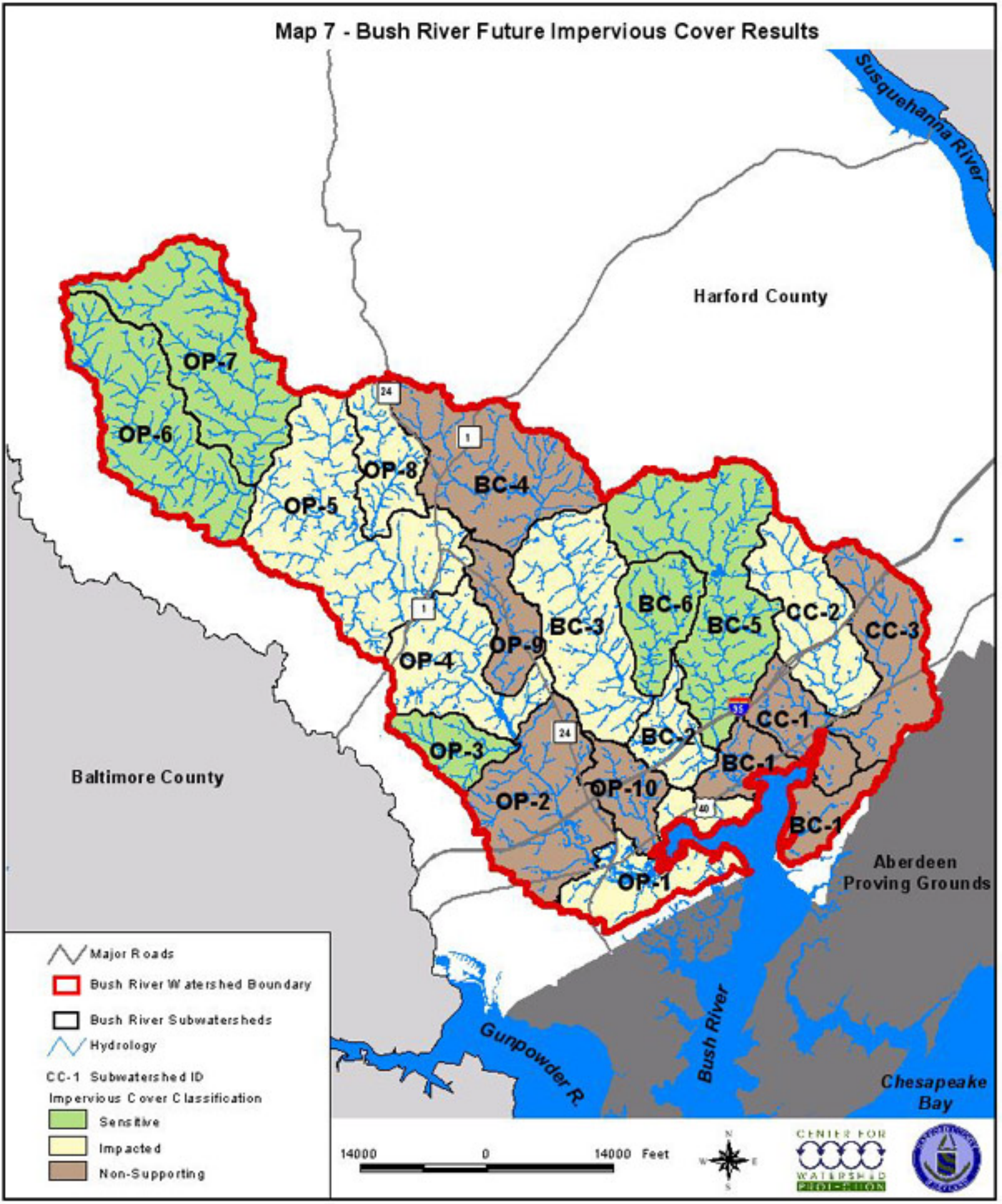
Table 6. Current and Future Impervious Cover Estimates for Bush River Subwatersheds

Subwatershed Name	Subwatershed ID	Current IC %	Current IC Management Classification	Future IC %	Future IC Management Classification
Otter Point DD	OP-1	15.4	Impacted	24.8	Impacted
Lower Winters DD	OP-2	17.1	Impacted	26.0	Non-Supporting
Mountain Branch	OP-3	5.8	Sensitive	6.9	Sensitive
Middle Winters DD	OP-4	11.1	Impacted	16.5	Impacted
Upper Winters DD	OP-5	7.6	Sensitive	11.0	Impacted
West Branch	OP-6	5.3	Sensitive	7.1	Sensitive
East Branch	OP-7	5.3	Sensitive	8.2	Sensitive
Bear Cabin	OP-8	11.5	Impacted	17.6	Impacted
Plumtree Run	OP-9	20.1	Impacted	28.2	Non-Supporting
Haha Branch	OP-10	14.8	Impacted	36.0	Non-Supporting
Bush Creek DD	BC-1	14.4	Impacted	34.5	Non-Supporting
Lower Bynum	BC-2	13.4	Impacted	20.0	Impacted
Middle Bynum	BC-3	16.8	Impacted	22.4	Impacted
Upper Bynum	BC-4	19.8	Impacted	29.3	Non-Supporting
James Run	BC-5	4.7	Sensitive	8.2	Sensitive
Little East Bynum	BC-6	3.3	Sensitive	6.8	Sensitive
Church Creek DD	CC-1	13.2	Impacted	33.5	Non-Supporting
Grays Run	CC-2	3.9	Sensitive	12.5	Impacted
Cranberry Run	CC-3	13.6	Impacted	30.6	Non-Supporting
Bush River Watershed		**10.7**	**Impacted**	**17.9**	**Impacted**

Map 6 - Bush River Future Impervious Cover Baseline Data



Map 7 - Bush River Future Impervious Cover Results



SECTION 2.4 OTHER SCREENING FACTORS

Given the great amount of existing monitoring and mapping data available in Harford County and recognizing that impervious cover alone is not always a perfect indicator of stream health, CWP developed two additional subwatershed classifications – Rurally Impacted and Impacted Special Resource. These additional subwatershed classifications also help to further refine the subwatershed classification system and derive priority (a.k.a. most vulnerable) subwatersheds. This section outlines the data sources utilized to refine subwatershed classifications and provides additional details on the new subwatershed classifications.

Data Sources

Data used to refine the initial subwatershed classifications came from a variety of sources, but most heavily relied on data provided by DNR and Harford County. DNR provided data in a number of formats, most notably, through the Bush River Watershed Characterization, monitoring data (MBSS and synoptic), and Stream Corridor Assessment Methodology (SCAM). The purpose of the report was to characterize the Bush River watershed using immediately available information. Data utilized from this report include fish blockages, forests suitable for interior dwelling species, wetlands of special concern, and hydric soils. Monitoring data is available through the Maryland Biological Stream Survey (MBSS). In the Bush River watershed MBSS data was available for water quality (e.g. nitrate concentrations), physical in-stream habitat, benthic macroinvertebrates diversity, and fish diversity. The Stream Corridor Methodology (SCAM), developed by DNR, consists of visual observations of specific problems such as bank erosion, livestock access, trash dumping, and fish blockages. Harford County has partnered with both DNR and Maryland Conservation Corp to collect much of the SCAM field data. Additional data from Harford County that proved to be useful in this portion of the vulnerability analysis included critical habitat areas, erodible soils, and digital orthophotographs. These data taken all together is reflective of current stream conditions and its corresponding land uses.

Rurally Impacted Subwatersheds

The Bush River watershed contains a mix of land uses including agriculture. This classification was developed to identify those subwatersheds that have strong agricultural influences. Although these subwatersheds are under 10% impervious cover, they may be degraded due to livestock access, and grazing and cropping practices that may have severely altered the riparian zone and created isolated stream bank erosion. Due to these factors, Rurally Impacted subwatersheds should be managed differently than other Sensitive subwatersheds.

An in-office analysis was conducted, utilizing available data, to identify Rurally Impacted subwatersheds. This analysis was done by creating a rurally impacted point system. In this system, data such as poor fish diversity and high amounts of cropland are assigned a point in favor of rural impacted-ness. Point assignments were largely based on a quartile approach. In most cases, a point was assigned to a parameter if it exceeded the 75^{th} Percentile. For example, the average nitrate concentration was taken for all sensitive subwatersheds. The 75^{th} Percentile of nitrate concentrations was 3.02 mg N/L. Therefore, all sensitive subwatersheds with nitrate concentrations greater than 3.02 mg N/L were assigned a point. Rurally impacted points were assigned for:

- High percentage of cropland
- High percentage of pasture
- High percentage of unforested streamside
- Livestock access per stream mile
- Eroded banks per stream mile
- High nitrate concentrations
- Presence of poor fish diversity
- Presence of poor benthic macroinvertebrate diversity
- Presence of poor physical in-stream habitat

Points were then added up and normalized to obtain a score. Subwatersheds with scores in the highest quartile were then designated as rurally impacted (for more details on the rurally impacted point system, see Appendix B).

As a result of this analysis, two subwatersheds, Little East Bynum (BC-6) and West Branch (OP-6) (see Figures 4 and 5, respectively) were reclassified as Rurally Impacted. Maps 15 and 16 illustrate the parameters utilized in this analysis. Field verification which consisted of stream habitat assessments and visual confirmation also reinforced the status of these subwatersheds as Rurally Impacted (see Section 2.5).

Figure 4. Little East Bynum

Figure 5. West Branch

Impacted Special Resource

The Bush River watershed contains large expanses of tidally influenced wetlands. The Impacted Special Resource classification was developed to identify those subwatersheds with an impervious cover between 10 and 25% and that also contain these valuable and unique natural resources. Due to the water quality and habitat value of these special resources, Impacted Special Resource subwatersheds should be managed differently than other Impacted subwatersheds.

An in-office analysis was also utilized to identify Impacted Special Resource subwatersheds. This analysis was done by creating a special resource point system. In this system, data such as good fish diversity and high amounts of wetlands are assigned a point in favor of special resource-ness. Point assignments and rankings were applied using the same methodology that

determined Rurally Impacted subwatersheds. While the methodology was relatively the same, the parameters that determined Impacted Special Resource subwatersheds were different:

- Presence of tidal influence
- High percentage of forest suitable for interior dwelling species
- High percentage of wetlands (NWI)
- High percentage of wetlands of special concern
- High percentage of forested streamside
- High percentage of habitat of local significance
- Presence of good fish diversity
- Presence of good benthic macroinvertebrate diversity
- Presence good physical in-stream habitat
- High expected increase in IC (change from Current to Future IC)

A more detailed presentation of this analysis can be found in Appendix B.

As a result of this analysis, three subwatersheds, Otter Point DD (OP-1), Church Creek DD (CC-1), and Bush Creek DD (BC-1) (see Figures 6, 7, and 8 respectively) were reclassified as Impacted Special Resource. Field verification that consisted of wetland assessments (to evaluate water quality and habitat value), stream habitat assessments and visual confirmation, verified fully established that these subwatersheds should be classified as Impacted Special Resource.

Although it did not quite score high enough in the impacted special resource point system, Haha Branch (OP-10) subwatershed was also reclassified as Impacted Special Resource due to field findings, tidal influence, and direct drainage to Otter Point (see Figure 9). GIS mapping also indicates that Haha Branch subwatershed may contain a significant tract of contiguous forest.

Maps 17, 18, 19, and 20 illustrate the parameters utilized in the impacted special resource classification.

Figure 6. Otter Point Creek DD

Figure 7. Church Creek DD

Figure 8. Bush Creek DD

Figure 9. Haha Branch

A summary of the classification changes as a result of rurally impacted and impacted special resource point systems is provided in Table 7. Map 8 illustrates these revised management classifications.

Table 7. Revised Subwatershed Management Classifications

Subwatershed Name	Subwatershed ID	% Current IC	Current IC Classification	Revised Management Classification
Otter Point DD	OP-1	15.35	Impacted	Impacted Special Resource
Lower Winters DD	OP-2	17.05	Impacted	Impacted
Mountain Branch	OP-3	5.79	Sensitive	Sensitive
Middle Winters DD	OP-4	11.07	Impacted	Impacted
Upper Winters DD	OP-5	7.56	Sensitive	Sensitive
West Branch	OP-6	5.33	Sensitive	Rurally Impacted
East Branch	OP-7	5.31	Sensitive	Sensitive
Bear Cabin*	OP-8	11.49	Impacted	Impacted
Plumtree Run	OP-9	20.99	Impacted	Impacted
Haha Branch	OP-10	14.82	Impacted	Impacted Special Resource
Bush Creek DD	BC-1	14.39	Impacted	Impacted Special Resource
Lower Bynum	BC-2	13.4	Impacted	Impacted
Middle Bynum	BC-3	16.75	Impacted	Impacted
Upper Bynum	BC-4	19.76	Impacted	Impacted
James Run	BC-5	4.7	Sensitive	Sensitive
Little East Bynum	BC-6	3.32	Sensitive	Rurally Impacted
Church Creek DD	CC-1	13.24	Impacted	Impacted Special Resource
Grays Run	CC-2	3.87	Sensitive	Sensitive
Cranberry Run	CC-3	13.6	Impacted	Impacted

Notes:
* Subwatershed classification later changes from Impacted to Sensitive as a result of field verification (see Section 2.5)

Map 8 - Bush River Revised Subwatershed Management Classification